

WHAT IS CLAIMED IS:

1 *Sub*
2 *a1*
3 1. An input device comprising:
4 a housing;
5 electronic circuitry for detecting user inputs and transmitting signals
6 corresponding to said inputs to an electronic device;
7 a sleep-mode circuit, coupled to said electronic circuitry, for activating a
8 reduced power operation of said electronic circuitry;
9 a hand detection circuit for detecting the proximity of a user's hand to said
10 housing and producing a hand detect signal; and
said sleep mode circuit being responsive to said hand detect signal to awaken
said electronic circuitry from said reduced power operation.

1 2. The device of claim 1 wherein said input device is a pointing device
2 and said electronic device is a computer.

1 3. The device of claim 1 wherein said hand detection circuit detects the
2 touch of a hand.

1 4. The device of claim 1 wherein said hand detection circuit is a
2 capacitive detection circuit.

1 5. The device of claim 4 wherein said capacitive detection circuit
2 comprises:
3 first and second electrodes on said housing for capacitive connection with a
4 user's hand;
5 a first circuit, coupled to said first electrode, for determining an amount of
6 time for charging of a capacitance connected to said first circuit; and
7 a second circuit, coupled to said second electrode, for determining an amount
8 of time for discharging of a capacitance connected to said second circuit.

1 6. The device of claim 5 wherein said first circuit comprises:
2 a comparator;
3 a controller coupled to an output of said comparator;
4 a voltage divider feedback circuit coupled between an output and a reference
5 voltage input of said comparator;

6 a detection capacitor coupled between said first electrode and a signal input of
7 said comparator; and
8 a switching circuit selectively coupling said signal input of said comparator to
9 high and low voltage supplies.

1 7. The device of claim 4 wherein said hand detection circuit includes first
2 and second electrodes covering more than 25 percent of the underside surface of a top surface
3 of said housing.

1 8. The device of claim 4 wherein said electrodes are mounted on first and
2 second opposed sides of said housing where they can be directly contacted simultaneously by
3 the grasping of said user's hand.

1 9. The device of claim 1 wherein said sleep mode circuit includes an
2 interrupt input, and said hand detection circuit periodically activates, and provides an
3 interrupt signal to said interrupt input when said user's hand is detected.

1 10. The device of claim 1 wherein said input device is a mouse, and said
2 electronic circuitry is an optical module for reflecting light off a surface and detecting
3 movement of said mouse relative to said surface.

1 11. A mouse comprising:
2 a housing;
3 electronic circuitry for detecting user inputs and transmitting said inputs to an
4 electronic device, said electronic circuitry including an optical module for reflecting light off
5 a surface and detecting movement of said mouse relative to said surface;
6 a sleep-mode circuit, coupled to said electronic circuitry, for activating a
7 reduced power operation of said electronic circuitry, said sleep mode circuit being responsive
8 to a wake-up signal to awaken said electronic circuitry from said reduced power operation;
9 and

10 a hand detection circuit for detecting the proximity of a user's hand to said
11 housing and producing said wake up signal, said hand detection circuit comprising
12 first and second electrodes on said housing for capacitive connection with a
13 user's hand,

14 a first circuit, coupled to said first electrode, for determining an amount of
15 time for charging of a capacitance connected to said first circuit, and

16 a second circuit, coupled to said second electrode, for determining an amount
17 of time for discharging of a capacitance connected to said second circuit.

1 12. A method for operating an input device comprising:
2 detecting user inputs and transmitting said inputs to an electronic device
3 external to said input device;
4 activating a reduced power mode of said input device in the absence of user
5 inputs for a period of time;
6 detecting the proximity of a user's hand to said input device and producing a
7 hand detect signal; and
8 awakening said input device from said reduced power mode in response to
9 said hand detect signal.

1 13. The method of claim 12 wherein said detecting the proximity of a
2 user's hand detects a change in capacitance due to said proximity of a user's hand.

1 14. The method of claim 13 wherein said change in capacitance is
2 determined using the simultaneous charging and a discharging of a capacitances coupled to
3 two electrodes.

1 15. A method for operating an optical mouse comprising:
2 detecting movement of said optical mouse using optical detection and
3 transmitting said movement signals to an electronic device external to said optical mouse;
4 activating a reduced power mode of said optical mouse in the absence of
5 movement signals or other user input for a period of time;
6 detecting the proximity of a user's hand to said optical mouse by detecting a
7 change in capacitance using the simultaneous charging and a discharging of capacitances
8 coupled to two electrodes, and producing a hand detect signal; and
9 awakening said input device from said reduced power mode in response to
10 said hand detect signal.

1 16. A computer mouse comprising:
2 a housing;
3 electronic circuitry for detecting movement of said mouse and transmitting
4 movement signals to a computer;

5 a hand detection circuit for detecting the proximity of a user's hand to said
6 housing and producing a hand detect signal; and
7 a response element, in one of said computer mouse and said computer, for
8 activating a function in response to said hand detect signal.

1 17. The mouse of claim 16 wherein said function comprises waking up
2 said mouse from a sleep mode.

1 18. The mouse of claim 16 wherein said function comprises activating a
2 light in said mouse.

1 19. The mouse of claim 16 wherein said function comprises providing a
2 message on a display for said computer.

1 20. An input device comprising:
2 a housing;
3 electronic circuitry for detecting user inputs and transmitting signals
4 corresponding to said inputs to an electronic device; and
5 an optical hand detection circuit for optically detecting the proximity of a
6 user's hand to said housing and producing a hand detect signal.

1 21. The input device of claim 20 wherein said optical hand detection
2 circuit comprises:
3 a light emitter mounted in a housing of said device; and
4 a light detector mounted in said housing and positioned to receive light from
5 said light emitter reflected off a hand proximate said device.

1 22. The input device of claim 21 wherein said light emitter is an infrared
2 emitter.

1 23. The input device of claim 21 wherein said light emitter and detector
2 are mounted in a recess in said housing.

1 24. The input device of claim 23 further comprising a shunt barrier
2 mounted between said light emitter and said light detector.

1 25. The input device of claim 24 wherein said shunt barrier is aluminum,
2 and extends from below the top of said light emitter to above the top of said light emitter, but
3 below the top surface of said device.

1 26. The input device of claim 20 further comprising a controller for
2 turning on and off said light emitter, and providing said hand detect signal only after a
3 predetermined number of on cycles provides a reflection to said detector above a threshold.

1 27. The input device of claim 26 wherein said controller further:
2 filters ambient light frequencies different from a frequency of said light
3 emitter;
4 cycles said light emitter on and off at a first rate before a hand detection, and
5 at a second rate after a hand detection; and
6 requires detection of a hand for a predetermined number of cycles before
7 issuing said hand detect signal.

1 28. The input device of claim 27 wherein said controller removes said
2 hand detect signal in the absence of a control input to said input device for a predetermined
3 amount of time after a detection of a hand.

1 29. The input device of claim 20 wherein said input device is a mouse.

1 30. The input device of claim 20 further comprising:
2 a sleep-mode circuit, coupled to said electronic circuitry, for activating a
3 reduced power operation of said electronic circuitry, said sleep mode circuit being responsive
4 to said hand detect signal to awaken said electronic circuitry from said reduced power
5 operation.

1 31. An input device comprising:
2 a housing;
3 electronic circuitry for detecting user inputs and transmitting signals
4 corresponding to said inputs to an electronic device; and
5 an optical hand detection circuit for optically detecting the proximity of a
6 user's hand to said housing and producing a hand detect signal, said optical hand detection
7 circuit including

8 a light emitter mounted in a housing of said device, and
9 a light detector mounted in said housing and positioned to receive light
10 from said light emitter reflected off a hand proximate said device;
11 a recess in said housing for enclosing said light emitter and light detector,
12 including a shunt barrier mounted in said recess between said light emitter and said light
13 detector; and
14 a sleep-mode circuit, coupled to said electronic circuitry, for activating a
15 reduced power operation of said electronic circuitry, said sleep mode circuit being responsive
16 to said hand detect signal to awaken said electronic circuitry from said reduced power
17 operation.

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